

NIFA Listens: Investing in Science to Transform Lives
Kansas City, Kansas
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Megan Haidet: Good morning, folks. Thank you for coming to "NIFA Listens: Investing in Science to Transform Lives." My name is Megan Haidet. I'm a program specialist in the Institute of Food Production and Sustainability, and I appreciate all of you for listening to our call and coming to provide your stakeholder input at this in-person listening opportunity.

[00:00:30] Before we get started, I just wanted to remind folks that the purpose of this listening session is to offer our stakeholders the opportunity to answer the following questions. What is your top priority in food and agricultural research, education, and extension? And what are the most promising science opportunities for advancement of food and agricultural sciences?

[00:01:00] Speakers will be given five to ten minutes to answer these questions, and our agenda will ... We have a little room for folks that may be unregistered to speak after our registered folks have spoken. I ask that you respect your given time allotment. I will be holding up five-minute and two-minute cards to show you that [00:01:30] you have that amount of time remaining, so please stick to that time.

Also, if you have to take any phone calls, please step out of the room. Respect those folks that are speaking. We have some snacks outside for our break at about 10, 10:15, and the restroom facilities are located out in the hallway.

I would like to begin this session with a message from our agency's director.

[00:02:00] Sunny Ramaswamy, the director of the National Institute of Food and Agriculture, would like to welcome you.

Sonny Ramaswamy: Hello. My name is Sonny Ramaswamy. I'm the director of the National Institute of Food and Agriculture. I want to take this opportunity to welcome you to what we refer to as "NIFA Listens." This is an opportunity for you to be personally involved in [00:02:30] telling us where we need to be investing our resources in regards to the research extension and teaching endeavors that NIFA supports and the work that you undertake at your institutions.

We are offering this opportunity for in-person input, and if it turns out that you've got additional thoughts that you want to share with us, you can certainly go to our web site, [00:03:00] nifa.usda.gov/nifalistsens. Again, nifa.usda.gov/nifalistsens. You have the opportunity to provide additional input through the first of December of 2017.

I can guarantee you that all this input that's going to be provided by you in person or through our web site ... I would encourage you to also talk to your colleagues that have not participated here to tell them to also provide input. We're going to take all this input [00:03:30] and analyze the information that's

been provided to us and incorporate that into the priorities that I'm going to be investing in over the next many, many years.

I want to thank you for participating in this very important effort, and look forward to engaging with you now and in future as well. Thank you very much.

Megan Haidet: Next, I'd like to introduce Dr. Muquarrab Qureshi. He's the deputy [00:04:00] director of the Institute of Youth, Family, and Community. Take it away, Dr. Qureshi.

Dr. Qureshi: Thank you and good morning, everybody. First of all, let me add my thanks to you all here in person, and people who are listening all across the country, for joining us today. This, indeed, is a [00:04:30] very important function of NIFA in terms of stakeholder input in all what you do.

Before I go into a very brief presentation, I would like to invite my colleagues to come and introduce themselves, who have taken the time to come and be with you, essentially, to participate in this very important function. You've already met Megan Haidet. She's our program specialist, and [00:05:00] we could not have done this program or these listening sessions without her tremendous logistical as well as intellectual help. Thank you, Megan, for all what you've done so far and continue to do.

Let me invite first my colleague, Dr. Denise Eblen, to come to the podium and introduce herself.

Denise Eblen: Good morning, everybody. I'm Denise [00:05:30] Eblen. I'm a deputy director at NIFA, where I have oversight of the Institute of Food Safety and Nutrition. I'm delighted to be here in Kansas City today to have our first session for "NIFA Listens." We're very excited to see how this goes.

I myself am an 18-year veteran of USDA. This is my third agency and I've been with NIFA about two and a half years. As everybody knows, we recently had an election. We have a whole new administration and we have a new secretary, a pending new undersecretary, and with this [00:06:00] becomes the opportunity for us to educate folks and share with them how we make our science priorities.

We have \$1.5 billion of taxpayer money that we're giving away. How do we make sure that we're giving it away to the right people who are doing the work we really need to solve these agricultural challenges with these transformative ideas, to really get the best value out of all these taxpayer dollars that we're spending?

We're asked over and over, "How are you setting your science priorities?" It's with sessions like this. [00:06:30] We want to make sure that we are at the cutting edge of science and that we're really solving problems that will change

people's lives, and solve these great agricultural challenges. How are we going to feed 9.5 billion people by 2050?

This is something that isn't something we're going to solve in a year or two, but we can set the foundation to do this. Again, we have great experts at NIFA. We have over 50 national program leaders who are at the top of their game, Ph.D.s in their field who have a great sense of what's going [00:07:00] on in their respective communities, but we want to make sure that we aren't missing anything.

We're here with sessions like this to hear from you all. We really want to know what we should be focused on. This will really help us. As we're developing our priorities going forward, we can share with folks on the Hill and with our new secretary and others that, "Yeah, we've talked with folks. We have these people that we've talked to. Here's their input. Here's how we've incorporated it."

We're really excited to be here today. We've got three more sessions coming up over the coming weeks. This is really going to help us as we set our priorities for coming [00:07:30] years. Again, thank you for coming. We're here to listen, and it's going to be a great day. I'll hand it back.

Dr. Qureshi: Thank you. Thank you, Dr. Eblen. I now invite my colleague, Dr. Tim Conner, please, to come and introduce himself.

Tim Conner: Thank you, thank you. It's really a pleasure to be in Kansas City. I spent a lot of years down the road in St. Louis, and so I feel like I'm back home or at least into this [00:08:00] general area of the good, solid Midwest.

I am the division director for the Division of Bioenergy, Bioproducts, and Bioeconomy. My training is more in the area of biotechnology and genetics. Many years in, really, agribusiness focused on pipeline development from discovery all the way through the stages of commercialization. Over the last eight months, I made a transition to work with NIFA, which I am very excited about and looking forward to working with broader stakeholders and developing in that area.

Overall, the division [00:08:30] is focused really on taking what we know about forestry and row crops and just even possibly energy crops, and developing paths in which we can improve rural prosperity by really pushing that major growth area we feel for the bioeconomy which is in the area of bioproducts and bioenergy.

I'm excited to be here and listen to your feedback, and listening to the breath that which we can take in and maybe develop systems that work together to really improve the bioeconomy. Thank you very much.

Dr. Qureshi: [00:09:00] Great. Thank you, Tim. Next in line is Dr. Peter Johnson, please.

Peter Johnson: Thank you, Muquarrab, and good morning. It's a pleasure to be here. My name is Peter Johnson. I am yet another discipline. [00:09:30] I work on the animal side. I'm a national program leader in the area of animal health and also animal well-being. By training, I'm a veterinarian, but I also was not satisfied just being a veterinarian, so I went on and have a Ph.D. in animal sciences.

I've actually been at USDA for 26 years, and they have been incredible years. [00:10:00] I'm grateful for the opportunity to work for stakeholders such as those in the audience, those listening. It's a great sense of gratitude I have to be able to work for problems of this country. I'm looking forward to hearing what your priorities are and thank you very much.

Dr. Qureshi: Very good. Thank you, Dr. Johnson. The last colleague [00:10:30] we have today is Selina Meiners.

Selina Meiners: Good morning, everyone. I work on the communications staff, and so our job is really to tell your story. I actually spent five years down the road at Fort Riley, Kansas, I was in the Army for 11 years, and so I really love Kansas and being back here. It's really one of [00:11:00] the greatest places in the United States.

A couple of ways, if you don't already know, that you can help us tell your story, is just by going on our web site, nifa.usda.gov, and signing up for our updates. There are many topics that you can subscribe to to include any announcements that we make. If you have any interest in telling your story through the media, you can always have your communications staffs reach out to us as well, [00:11:30] and we can work together to facilitate media engagements.

Also on Twitter, if you're on social media, even today, get on Twitter and mention us @usda_nifa, and say you're here at the listening session, for example. Then you'll see that I'll go in and I'll like it and comment as well. If you want to share your science impacts, you can do that through Twitter as well by using our hashtag, #nifaimpacts. [00:12:00] That's one way that you can flag your stories to us and we can then retweet them and repurpose them. They might end up in "Fresh from the Field," one of our weekly impacts newsletters, or our NIFA update. That's our goal, to tell your story. Help us help you, and it's our pleasure to do so.

Dr. Qureshi: Thank you, Selina, very much. I also bring greetings to you from my boss, Dr. [00:12:30] Meryl Broussard, who could not be here today with us, but he provides strategic programmatic leadership to all program areas of National Institute of Food and Agriculture.

As you can see, with the presence of these colleagues, that NIFA truly values what we are doing here today by the presence of these people who are not only in their own right administrators or program leaders, but also [00:13:00] tremendous subject matter experts with tremendous academic and professional background in the area of production agriculture and allied disciplines.

I'll introduce myself as well. I'm managing the Institute of Youth, Family, and Community. Like Peter Johnson, I'm also a veterinarian, and I also was not satisfied with DVM alone. I got my master's in microbiology and my Ph. [00:13:30] D. in immunogenetics and immunotoxicology from Cornell, and I served at a major land-grant university for about 20 years before I moved to NIFA. I absolutely love every day, because I think we do make a difference in what we do in the lives of people through USDA.

To start with, I would ... There [00:14:00] you go. NIFA, I'm sure most of you know ... NIFA is an extramural science funding agency of United States Department of Agriculture. National Institute of Food and Agriculture funds activities in areas of research, education, [00:14:30] and economics, and that's the mission area we are in.

Our mission is really to invest and advance agricultural research, education, and extension, to help solve societal challenges. It's really a very overarching mission, a very noble mission, in my opinion, and we do this by collaborating with leading scientists and policymakers, decisionmakers, educators, organizations, [00:15:00] both internally, domestically in the United States, and across the world, to really find very innovative solutions to solve both global and local problems. We believe that science-based evidence really helps us to make more discoveries and apply those discoveries to help of people.

[00:15:30] I think it would be important for us to know how NIFA sets its priorities. NIFA takes its marching orders, essentially, through congressional languages which are articulated for us in what we call the farm bill and through the appropriation process. We also consider [00:16:00] what our secretary of agriculture considers the top priorities ought to be for our agriculture mission area, and also guidance from the White House.

We are also interested to know what our internal stakeholders, people like those who were introduced to you earlier today. They are in their own right as our intellectual capital. These are the [00:16:30] people who interact with our stakeholders almost on daily basis through writing requests for applications, through running panels, through making grant awards, through holding PD meetings, by doing site visits, attending professional society meetings.

All of these things keep our internal stakeholders or program leaders and staff really very, very current in terms of the [00:17:00] needs of stakeholders. That's the mechanism we constantly lean on in terms of defining the priorities which we're going to have for current and the future years, as well as understanding what the gaps might be for us to tweak and add to in our current offerings and portfolios.

Also, most importantly, we solicit what is called external stakeholder input, such as you. [00:17:30] We have now started external listening sessions and this is actually the first of the four sessions we are going to have. This is actually the first of the first ever external listening sessions that we are having across the

country. This one is happening here in Kansas City. The next one would be in Atlanta next [00:18:00] week, and week after that we'll be in Sacramento, California, and the last one would be Maryland, I believe. Yes.

We are really very excited that in about a couple of months' time, we not only would have these personal listening sessions, but as Megan earlier told you and also Sonny was sharing that with you, that you would have opportunity to provide your feedback through online mechanism and the addresses and everything, all the links are also [00:18:30] provided for you.

Essentially, we're asking two simple questions. What do you think are ... Oops ... are the top priorities, your top priorities in food, agriculture, research, extension, or education that NIFA should address? I would emphasize here that we're hoping that we will get input from you all for our entire about \$1.5 billion [00:19:00] portfolio. We don't want these listening sessions to be research-centric or education-centric or extension-centric. We want to listen from you on every aspect of what we do, because that's really what our portfolio is all about. It's research, extension, as well as education.

Then, what are the most important promising science opportunities for advancement of food and agricultural sciences? We [00:19:30] hope that in your comments you would inform us and educate us about what do you think are the top priorities for ...

Okay, so how will stakeholder input be used? As I said, stakeholder input would inform prioritization of science emphasis areas. Our agency, whatever your agency do, the foundation [00:20:00] of our agency portfolios are based on science, and we currently have about nine science emphasis areas. We hope that you will identify the gaps in the programming, determine which programs may be redundant or underperforming.

I think that's also very useful information for us. Have we really maxed out in funding certain areas, and we can bring some closure to those areas and move on? Also, [00:20:30] combined with input from NIFA employees, feedback gathered through initiatives, through the initiatives will be used in the context of NIFA's current science emphasis areas to identify gaps in current portfolio and potential investment opportunities.

These inputs truly, truly wouldn't form our budgeting process and our funding priority process. We've already shared with you [00:21:00] the sites, the dates, and the locations are given here, and also the electronic links are also provided. With that, I think we'll move forward and I will hand over meeting to Megan, and she is going to now take us through the rest of the day. Thank you.

Megan Haidet:

Thank you, Dr. Qureshi. [00:21:30] The rest of the meeting is about you. We're here to listen, so as we move through this agenda, we're going to remain flexible with your schedules. Five minutes, ten minutes max for your comments.

We do have a few folks with PowerPoint presentations. If you have not yet uploaded your PowerPoint presentation, you can meet Erin at the back of the room. [00:22:00] If you don't have one, that's fine as well.

We will begin with Dr. Mullen, if he is here, but I have a ... Wonderful. I'll just tell you a bit about me. I'm relatively new to NIFA. I've been at NIFA for less than one year, and I came from the Bureau of Land Management, where [00:22:30] I worked on a native seed collection program. Our actions were to respond to wildfires, so we were putting native material back down after those fires.

Just loading [00:23:00] this PowerPoint. You all set? All right. Dr. Jeffery Mullen from the National Corn Growers Association. I'll just ask that all speakers present from the podium, so the folks that may be viewing this presentation online can keep an eye on you and/or your presentation when the video stream goes back and forth. [00:23:30] Thank you.

Jeff Mullen:

Good morning. My name's Jeff Mullen. I'm with the National Corn Growers Association and want to talk to you today about some efforts that we're trying to build a multi coalition, if you will, around phenotyping, a new initiative. I want to mention that Connor Hamburg is my counterpart out at the Washington, DC, office, so he's basically a lobbyist.

Want [00:24:00] to quickly go through what we're talking about, so just first, the National Corn Growers does support the continued support of several national programs, and they're listed there so I won't go into it. We're also seeking roughly \$7 million for a national agriculture genotyping center in Fargo, North Dakota.

What I'm here today is to talk about the national phenotyping initiative that we're basically [00:24:30] trying to pull together support for. Obviously, this could go into a farm bill if possible, or it could be manipulated or incorporated into an existing national program.

Just quickly here, in 1997 National Corn Growers drafted a proposal to sequence the corn genome. That basically was morphed into the National Plant Genome Initiative, and so we're coming up on 20-year anniversary [00:25:00] here in eight days. As of today, basically, there's been about \$1.5 billion of genomic research that has led, to my count, 75-plus plant genomes that have been sequenced.

I'll just quickly run through these, and these are sorted by year. Starts off, obviously, with Arabidopsis, but there's a laundry list of genomes. [00:25:30] You can see very, very progressive in 2010, 2011. If we move on to 2012 and '13, likewise, a lot of activity around sequencing plant genomes. Last slide here covering '14, '15, and '16 and '17. Still quite a bit of activity, but not quite as much, maybe, as 2010 to '12.

In general, what I listed here is just [00:26:00] the min, the max number of genes and what the average is across all those genomes, and roughly around 35,000 genes. You've probably seen this. Most breeding programs will say phenotype is an interaction of genotype and the environment, and you could also throw in management as well. What we're, I think, doing is moving very fast to being genome sequence-rich, and I think where we'll move in [00:26:30] the next decade, 10 to 20 years, will be in gene function and determining phenotypes. That phenotypic is what we want to talk about.

Just quickly, we're trying to build a multi-crop initiative that will, hopefully, inspire research in the next decade. Again, it's to really address that GxE interaction. This is an initiative to build off of that 20-year sequencing data and then [00:27:00] we actually think it will be very important for the US science competitive nature that we should lead the crop improvement efforts, in my view.

A lot of what this will do, I think, is benefit farmers. The goal is to improve crops, improve technology that can not just feed research, but it can actually feed farmers and their management tools as well.

Goals, there are three goals that I lay out here. Obviously, [00:27:30] it's to support research that leverages that plant genetic data and then matches it with phenotypic and environmental data. That is to try and predict crop performance based on that data. I won't go into the details here, but it's really to try and understand fundamentally what those processes are that regulate yield, and then how do you use that to improve crops?

Second is to, obviously, understand the growing environments. They [00:28:00] vary, and that's really critical. That's that GxE again. That comes down to what genes, what alleles, provide you, for example, drought stress or heat stress. I think there'll be a lot of effort around gene editing as well, and that will feed right into that sequence data, that phenotypic need.

A lot of this is trying to understand genes that regulate key agronomic traits and how [00:28:30] do they impact yield? How do those genes interact amongst themselves? Then, how does that environment impact that gene expression? Eventually, how can we select genes or alleles that can meet the needs of the farmer regardless of what kind of environment they farm in? Then you'd also say that there's a lot of need to understand what gene expression and what regulation is going on at the different stages of plant growth, [00:29:00] as well.

Three is ... Man, has things really changed since I went to grad school. Bottom line is, we really need expertise in many, many disciplines that I think are important today, and that just means we need genetics, genomics, plant physiology, which is my background in agronomy, but you got to combine that with climatology, computer science, [00:29:30] software development. All these really are very, very important for crop improvement these days.

Second bullet is, we need to build high-throughput phenotyping. I've done quite a bit of phenotyping in my past careers at Pioneer and Monsanto. It's huge. It's a challenge. It's what I call the bottleneck right now. Used to be transformation, now I think it's phenotyping. Obviously, this is also to [00:30:00] train students for the future, so we don't want to under-emphasize that.

Impact statement here, this is really to benefit the farmers. If we're going to feed our population in 2050, we need to be doing things now in order to get there in 25 years. We think, again, that what we're proposing will be valuable, not just for US farmers but for feeding the world.

Just [00:30:30] a statement on inclusion of multiple crops. This is not a corn project, even though I work for the Corn Growers Association. We realize that this needs to be a multi-crop-supported initiative, and so we're right now talking to other commodity crops and getting their buy-in, their interest, and part of that is to go to the Hill with multiple crop lobbyists to convey this message.

You're probably wondering [00:31:00] what this is, and we're leaving it open, okay? That's because this is grassroots up. We have ideas, but [inaudible 00:31:08] we want to hear what the other commodities are saying. I just want to point out that obviously, if we're going to study GxE, we need to have different environments, and so we need field phenotyping capabilities at multiple locations within each crop's growing region.

I would also say that I think we need to take a serious look at [00:31:30] what our transformation and plant regeneration capabilities are at universities. Again, I've worked at Pioneer, Monsanto. They're fabulous, but we need to have something that is comparable at the public universities, especially as, I think, gene editing will come on very, very strong.

Lastly, we're talking about massive amounts of data. Let's plan now about how to manage that within a crop as well as across crops. [00:32:00] With that, I think was my last slide. I wanted to say thank you. Are we taking questions later or one or two right now? I got two minutes. We're ticking here. Two minutes for questions. Anybody? That's fine if you don't. Yes?

Denise Eblen: Thank you for your presentation. It's really interesting, [00:32:30] and I think by having short presentations we really get to the heart of the headlines. As you said, you're a corn person, but you mentioned other commodities. Is there a similar interest in other commodities? Are you leading the vanguard? If the other commodity folks were here, would they have a similar interest?

Jeff Mullen: We've spoken, I've met with, obviously, the corn, the soy, the sorghum, [00:33:00] cotton, peanuts ... We've talked to hops. We've talked to some folks in the wine grape industry, and peanuts, if I didn't mention that. I'm trying to think who's ... We're still in that process here now, so the idea is everybody to date has expressed interest, and so we're wanting to build that coalition and

then [00:33:30] sit down and really hammer out what should that look like? What would be the funding request and all that kind of stuff?

Denise Eblen: Any sense of what's going on internationally? Is America leading this or are there other countries who are further ahead of us?

Jeff Mullen: Yeah, great question. I think we're strong, don't get me wrong, but do I think we're leading in a lot of these areas, or some of the areas? Probably no. [00:34:00] Very strong phenotyping in Europe and Australia. Crop modeling, for example, is probably led by Australia. Again, I think a lot of what we're talking about is data that feeds crop modeling, and so I think there's a need to make sure the US does not lose their position, in a way.

Then I think there's great opportunities to [00:34:30] work with some of our counterparts internationally, but we're stressing the need to build up those programs here, to ensure our competitiveness and our role, if you will.

Denise Eblen: Thank you very much.

Megan Haidet: Thank you so much, Dr. Mullen. Next up, we have Tesfaye Tesso from Kansas State University. [inaudible 00:35:11]

Tesfaye Tesso: [inaudible 00:35:12] [00:35:00] Good morning, everyone. [00:35:30] I'm Tesfaye Tesso from Kansas State University, but I'm sorghum breeder at K State also. I'm here not to speak for sorghum or for KSU, but I'm representing the National Plant Breeding Coordination Committee, who came together to respond to these two questions from NIFA.

Maybe before I go into directly [00:36:00] passing that message to you, it's good to go through these statements of Plant Breeding Coordination Committee that actually is a guiding principle for the responses that we came up with.

The Plant Breeding Coordination Committee represents the interests of the plant breeding community, working on various crops, basically, including forests. Plant Breeding Coordination Committee encourages [00:36:30] collection, evaluation, and the utilization of diverse germplasm. The PBCC strives to maintain the genetic diversity of crops while continuing efforts to develop new and well-adapted cultivars.

The PBCC provides forum for leadership regarding issues, challenges, and opportunities of long-term strategic importance. The [00:37:00] PBCC's also concerned about the significant reduction in public-sector commitment to plant breeding infrastructure and training, basically. As these concerns arise from a reduction in both scientists committed to plant breeding, instead agricultural experiment stations, and also a reduction in the national public sector investment for plant breeding, so the committee looked into these principles

[00:37:30] and then crafted their response that every member of the committee had opportunity to contribute to and agreed on.

With that, I will go to responses to the first question about what top priorities are in food, agriculture, research, and extension. The number we came up with, three major priorities that we [00:38:00] or the committee wanted NIFA to address in the future, the first one is increasing funding that is directed to public sector plant breeding programs that are involved or working to develop varieties adapted to specific environments, basically. These are often left out by industry, so the committee felt investment in that area would enhance agricultural production.

[00:38:30] The second one is to respond to the needs and the challenges of farmers. That means increase investment to breeding programs that directly respond to the needs and the challenges of farmers and the consumers. To those programs that strive to enlarge your genetic base of crops, and then accelerate progress, so basically to germplasm enhancement. [00:39:00] I have hard time seeing that.

The other area, priority area, that the committee identified is for NIFA to create a kind of platform where public research breeding programs can engage with farmers and seed industries and then discuss on setting priorities and their needs as well as also [00:39:30] looking at opportunities.

The last priority was about the long-term granting cycles spanning more than five years. Most of the grants that are available today are within a five-year period limitation, but plant breeding programs normally take longer than that, so it eventually led to programs becoming projects. [00:40:00] The committee is not asking for long-term investment without accountability, but that has to come with increased scrutiny and accountability, and also that investment needs to be outcome-driven. That means it has to demonstrate clear pathway to impact.

Such projects also need to be focused on priority needs of growers. There [00:40:30] are probably research investments that are often made with little or no regard to the needs of the growers and then other users, so the committee highlighted on that for NIFA to consider in its investment.

The response to the second question as to most promising science opportunities for advancing food and agriculture. [00:41:00] Our committee looked at plant breeding as one possible opportunity that can enhance agricultural productivity. Plant breeding is not a new science. Obviously it is an old one, but it is not an extinct one, so it has played significant role in the 20th century in turning agricultural productivity into what we see today, and holds also enormous promise to achieving [00:41:30] food security and food sufficiency in the future as well.

Speaker 10: Would you like, so you don't have to ...

Tesfaye Tesso: Ah, that will be good. The other opportunity we've looked at was [00:42:00] the application of contemporary sciences to plant breeding for improved [inaudible 00:42:08] Plant breeding is an old science, but it is being updated by discoveries in other areas like translational genomics, engineering, for example the high-throughput data-capturing mechanisms are becoming easier and then computational sciences and the mathematics.

All these developments in other fields of science are boosting [00:42:30] plant breeding activity, so investments in that area will make and revitalize, actually, plant breeding programs and then move us towards impactful paths.

These opportunities, training of new plant breeders, appreciation and application of the contemporary sciences we just talked about, that means there is a need for skills [00:43:00] for improved experimental design and then for new protocols to obtain high-quality data, need for enhancing and exploiting interdisciplinary nature of plant breeding, new skills for better characterization of environments.

The speaker before me was discussing about genotype by environment and interaction and those modeling. Those are really key for success in plant breeding. Incorporating new and extensive phenotype data with genotype data. Lot of models [00:43:30] are coming up, but still more remains to be done in order to make sure that the models exactly predict what the phenotype is.

Advanced analysis to improve models and efficiency, to handle large, multidimensional data sets. There is a lot of progress being made in this direction, and then the committee also stresses that those areas need investment, especially in training people who are capable of [00:44:00] doing this part of science. I think this is all. Thank you.

Megan Haidet: You have about a minute and a half. Are there any questions?

Denise Eblen: Thank you, Dr. Tesso. Can I ask you to comment? Couple of things. [00:44:30] Where do you see USDA or NIFA's role in ... This is a huge initiative, and of course the whole agribusiness enterprise would be interested in this, so where do you see the public funding versus the private funding? What do you think NIFA, USDA, should be focused on versus the huge investment I know was going on in the private sector?

Also, any comment, like my previous question for the previous speaker, about international investment, international focus on this, and is this an area where the US is very competitive or falling [00:45:00] behind? Just your comment on those couple of things.

Tesfaye Tesso: I think one of the areas where NIFA ... I think I highlighted in one of my slides, where we need to cultivate interaction or create platform that will foster interaction between public plant breeding programs and seed industries, and the farmers as well ... I am a sorghum breeder and I can see ... I do interact a lot with seed industries a lot. [00:45:30] We find a lot of commonality between us, but there are also a little bit of differences, and then the farmer is also standing there.

We've never had that opportunity of coming together and see what real priorities are for farmers and then how ready is industry to deliver onto that one, and then also the public plant breeding programs. If I take one simple example for sorghum, with today's technology sorghum growers can harvest [00:46:00] crops that are this tall, whereas the industry is really interested in marketing just a traditional, shorter type cultivars.

We, sitting in public programs, we know that by increasing plant height a little bit to that level, we can also contribute to yield potential significantly. I think we need that kind of platform where we can come together and then discuss and then chart a way forward. Your [00:46:30] second question was about ...

Denise Eblen: Commenting on international ... Where are we in terms of international ... What's going on internationally? Are we at the top of the game, or not so much? Just your comment on that.

Tesfaye Tesso: This science is international. It is not really limited to one or two countries, and then we've seen that discoveries, materials, germplasms, from one part of the country making impact everywhere. There are materials that will come into US [00:47:00] breeding programs through increased international collaborations. There are also knowledge that will be generated and then serve both the United States and other countries that are involved in that partnership.

Again, in my project, I do participate in a number of international programs, and then I do see benefit both to collaborating countries that are working with me there and the information that is generated from that is also helping my program [00:47:30] over here. That will be a great thing if we can work as international team, actually.

Denise Eblen: Thank you.

Tesfaye Tesso: Thank you.

Megan Haidet: Thank you so much. Next, we have Katherine Kelly from Cultivate Kansas. Cultivate Kansas City, yes. A reminder, if [00:48:00] anyone has a flash drive, you'd like to upload a presentation for later on today, please contact Erin in the back of the room, and if not ...

Katherine Kelly: Thank you. No PowerPoint.

Megan Haidet: You're welcome. Thanks.

Katherine Kelly: Good morning. My name is Katherine Kelly. I'm the executive director and co-founder ... Sorry, I've been dashing this morning ... Of Cultivate Kansas City, a nonprofit organization that works to grow food, farms, and communities in support of a healthy local food system [00:48:30] with local food available to all.

I appreciate this opportunity to speak to you, and to advocate ... It's funny. I'm getting nervous. I don't often do this. You never know, when you wake up in the morning, what's going to happen. I appreciate the opportunity to advocate for NIFA programs that benefit our community, because we've certainly seen the effect of that, as well as to advocate for future priorities and research extension and education.

I'm going to be speaking as somebody who [00:49:00] represents specialty crop producers and in particular farmers who operate within the greater metro area. There are three key priorities that we see spanning research, extension, and education. First is climate change. Farmers on the ground, and I speak as somebody who is a farmer, have been experiencing the impact of climate change on a nearly daily basis. I've certainly seen its impact over the last 15 years.

As a farmer myself, I began to see the trends when the harlequin bug ... Thank [00:49:30] you. It's funny, I don't often ... I do a fair amount of public talks and don't do this very often. As a farmer myself, I began to see the trends when the harlequin bug, a southern pest, showed up in my fields, when I found myself having to do multiple plantings of the same crop, so A, B, C, and D.

Across the metro area, impacts range from the emergence of a variety of pests that are new to this geographic area to weeds that are growing more aggressively than before, such as spiny amaranths, bindweed, and foxtail, to changes [00:50:00] in rainfall patterns that play out in our fields, at our open-air markets, and in the overall quality of fruits and vegetables.

As urban farmers in specific, one of the impacts we've seen is higher overnight temperatures exacerbated by the urban heat bubble, with the resulting narrowing of the crops that we can grow to crops that can tolerate sustained high temperatures, combined with temperature swings, excessive rainfall, and extended drought.

We need NIFA to fund and to continue its funding focus across all of its programs [00:50:30] on climate change. Farmers need solid research and extension work on plant varieties that can tolerate the impacts of climate change. We need breeding programs not just for plasticity, but for specific microclimates to help us adapt as conditions continue to change and become more extreme. We need more support for controlled-environment agriculture, not just research and extension but grant programs that will help with the

capitalization of greenhouses similar to the equip grants that finance high tunnels.

We need [00:51:00] research done on weed management and on the gradual invasion of new weed and pest species so that we can more quickly and effectively respond. We need, in particular, cross-disciplinary research, ecosystem-based approaches rather than siloed approaches, and we need scientists who are trained in systems-based and collaborative work.

We can't pretend that climate change isn't happening. To the degree that we allow politics to muddy a science-based engagement with the realities of climate change we are agreeing to a riskier, less predictable, and less intelligent food future.

The [00:51:30] second priority we see is training for future farmers. Having a reliable national food supply is going to be more important than ever as climate changes, as world politics change in response to political upheavals caused by droughts, famine, and rising energy costs. Farmers are retiring and farms are consolidating at unsustainable rates.

We need aggressive outreach and education to prepare current and future farmers in a rapidly changing environment, both climate and market, and to begin to replace the farmers we are losing. [00:52:00] Ag and hort education needs to begin at the grade-school level and clear paths need to be laid out from high school ag and horticulture classes to owning and managing productive food farms.

Third, NIFA needs to continue its commitment to ensuring that all members of our society have access to good, healthy, and local food. The obesity and diet-related crisis is not over. We need to keep our attention on ensuring access and ensuring food education is a priority.

Cultivate Kansas City has been providing nutrition incentives to low-income community members [00:52:30] for over seven years. In 2015, we partnered with the Mid-America Regional Council and were awarded a FINI large-scale grant. The money received through the FINI grant has allowed us to expand our programs and offer healthy options to families while providing additional revenue to producers at over 20 farmers' markets in Kansas and Missouri.

Programs like this give NIFA double value for their money, helping the lone consumer but also the local farmer. NIFA's work is going to be more important than ever in the decades [00:53:00] to come. We need you to be powerful advocates for science-based agriculture and for the importance of food and agriculture in our society as a whole. There we go.

Megan Haidet: We have time for questions, if there are any.

Speaker 12: We have planted [inaudible 00:53:23]

Katherine Kelly: That's good.

Denise Eblen: Can you hear me? Okay, thank you for your presentation. [00:53:30] You hit three really important things. One is climate change and how it's not just some big industrial-level thing, but it's really impacting you guys locally as farmers and growers and producers. We hear the same thing across the country. Hearing from you gives us that shot in the arm to remind us to keep drumming that drum.

Katherine Kelly: Good.

Denise Eblen: Second, education. Educating the next generation of farmers and who's going to pick up when we all retire? Then third is about the consumers. It's not just enough to keep producing [00:54:00] more products, but who's going to eat these? Who's going to wear the clothes that we're making? The food, fuel, fiber. We need to make sure that we're thinking of those folks as we do these transformational science things that we're funding.

Are we thinking about the consumers at the end and what do they need? What kind of food do they need to have so that the healthy choice is the default choice and it's available to them? You spoke about obesity. The CDC just released some new numbers and 39% of Americans are obese. That can't continue. That's not a good trend. You hit on three really [00:54:30] important things there in just your five minutes, so thank you for that. I really enjoyed your presentation, thank you.

Katherine Kelly: Yes, and I really can't emphasize enough the training of future farmers. We work with refugee farmers who come here who really want to farm, know how to farm, are good farmers, and we are helping them start to address that need, but that's a drop in the bucket and we need more fruit and vegetable farmers across the region, across the country, and we also need, obviously, larger-scale row crop producers [00:55:00] and livestock producers.

Denise Eblen: I should mention, FINI is one of the programs administered in my particular institute, so I'm delighted to meet a FINI recipient and hear that you're doing great things.

Katherine Kelly: Good. Thank you.

Denise Eblen: Anyone else?

Tim Conner: Hi, thank you very much for sharing with us as well. Just had one question. You represent a lot of specialty crop interests and I'm curious if you can share a vision for how these different entities come together to think about the vision of urban agriculture, urban production that might [00:55:30] help us understand

a little bit more about the perspectives and the risks. We know what the challenges are, but the vision of how it looks.

Katherine Kelly: What I see going ... Over the last, I don't know, couple decades now, we've been working on urban agriculture and it's primarily been focused on community gardens, on home gardening, on small-scale farms. What we're seeing now is an increase in farmers who want to make a living, who want to create jobs, [00:56:00] who want to invest capital in greenhouses and in high tunnels, so we're seeing a diversification of the models of agriculture in the city. We're seeing people buying up old buildings in Kansas City and repurposing them to LED production.

I think that that kind of activity, that scaling up, that use of higher technologies, needs to continue. As [00:56:30] the climate continues to change, people are going to keep crowding into the cities, and we need agriculture in the cities. We need people in the cities understanding and exposed to agriculture on a daily basis.

I'm very much envisioning cities that look different where you can't get in your car and drive to work without seeing some form of agriculture or an open-air market or some place that's known for carrying local food. I see it as being much more embedded [00:57:00] just in our daily lives, the same way we expect to see parks on the way to our workplace.

Megan Haidet: Thank you, Katherine. Next up, we have Aaron Harries from the Kansas Wheat Commission. [00:57:30] Thank you.

Aaron Harries: Morning, everyone. My name is Aaron Harries. I am the vice president of research and operations for the Kansas Wheat Commission based in Manhattan, Kansas. Going to be very brief this morning. I'm going to talk one minute for every dollar in the current price of wheat, so that's about three minutes, for those of you keeping track.

First, on behalf of the over 30,000 Kansas wheat farmers from the Wheat State, we would like to thank NIFA for hosting these sessions and [00:58:00] thank you for your continuing support of the best research and interests of US farmers. We support agriculture research that improves disease resistance, yield, and quality of wheat.

In particular interest to Kansas wheat farmers is research that addresses current and future viral threats, which can have a large negative economic impact as well as other disease threats such as scab, fusarium head blight, and things that are on the radar, including wheat blast.

[00:58:30] We recently cooperated with Kansas State University and received a ROAR grant from the Foundation for Food and Agriculture Research for wheat streak mosaic virus research. We've had an outbreak of wheat streak mosaic

virus pretty severe in Kansas the past two years as well as the entire central high plains of the United States, so we appreciate that program where we can have a quick response and do some work on the ground [00:59:00] to mitigate that problem.

We are also big proponents of public-private collaborations. We support the new NIFA Commodity Board matching grant program, of which we are a participant. This novel effort to match producer dollars with USDA funds will maximize and accelerate returns on vital wheat research. The farmers that we represent and our organization leaders are very pleased by the opportunity this program presents.

[00:59:30] We are current partners with Kansas State University. Our farmer producers put up \$500,000, which is being matched by that Commodity Board matching grant program to do a quality research project at Kansas State University, and we look forward to other collaborations underneath that program. It is very much appreciated.

Kansas wheat farmers spend roughly \$1.5 million each year on wheat research. We appreciate any ability to leverage these funds. [01:00:00] In 2017, the world wheat community will finally have access to a complete map of the wheat bread genome. The international consortium for sequencing that genome actually started in Kansas in 2005, so this is a breakthrough year for wheat in the world.

The wheat genome is five times larger than the human genome. That's an incomprehensible amount of data that we have to deal with, so we support research into bioinformatics and the ability to handle [01:00:30] that data. This wheat genome map of bread wheat will provide breakthroughs in genetic research in the next five to ten years. Kansas wheat farmers have also invested \$11 million of their own funds to build the Kansas Wheat Innovation Center in Manhattan.

Also, a venue for public-private collaboration, the Wheat Genetics Resource Center, a library or collection of ancient wheat relatives, part of Kansas State University, is currently housed in our Wheat Innovation Center, and is [01:01:00] leveraging, again, private dollars to help research there.

The center also provides facilities for scientists to accelerate research through modern technologies such as double haploids and genotyping by sequencing. We believe the future holds much promise for gene editing technologies, which is going to be a big part in the future of wheat research. We support the establishment of infrastructure to conduct that type of research, [01:01:30] and we know that our partners at Kansas State University have the expertise and are working on developing that infrastructure.

That is all the comments I have. Thank you for your time. Are there any questions? Okay, thank you.

Megan Haidet: Thank you, Aaron. Next up, we have Jim Anderson [01:02:00] from the Missouri Wine and Grape Board. While he makes his way up here, I just have a question for you guys. Did you ever hear about the magic tractor? It turned into a field.

Jim Anderson: Wow, that's a tough one to follow up on there. [01:02:30] Thank you. My name is Jim Anderson. I'm the executive director for the Missouri Wine and Grape Board. On behalf of the Missouri Wine and Grape Board and the National Grape and Wine Initiative, that I'm representing also today, that I'm a board member, I'm providing these comments regarding my experience of the US grape and grape product community.

National Grape and Wine Initiative is made up of researchers, private wineries, [01:03:00] winery operators throughout the United States that serve on that, so it's very much a team approach for research, extension, and the private industry working together on the grape and grape products needs in the United States.

The grape industry's the fastest-growing specialty crop in the United States. From wine grapes to table grapes to juice grapes and raisins, grapes have the largest value of specialty crops, especially when you combine [01:03:30] the economic impact of wine.

We just do this to our Wine America Board out of DC, but just announced that roughly a \$220 billion industry, the wine industry is in the United States, and when we talk about grapes and grape products along with that. In Missouri alone, we're a \$3.2 billion industry with 135 wineries in the state of Missouri, 1,700 acres of grapes, and about 400 grape growers [01:04:00] scattered across the state of Missouri.

Research funding is vital to the future of the grape and wine industry, our economic contribution. Although the USDA has long been top public funder of that research, funding has not grown. Which to say that real numbers, our nation's investment in farms and food is shrinking, especially crops like grapes have been historically underserved by general research funding.

Vital funding such as NIFA, Specialty Crop Research Initiative, [01:04:30] SCRI, and especially block grants, the competition's very fierce for that for us and for the wine industry. The need and urgency will only accelerate as we seek much-needed strides in plant breeding, genetics, genomics, and plant characteristics, as we heard from our folks a little bit today.

Adapting to changing climate, and race to identify, address threats from pests and diseases, and we'll see that [01:05:00] throughout the United States. I'm not just talking on vinifera grapes, but also our French-American hybrids that we grow here in the Midwest. Some of our northern varieties too, that we see that are grown in Minnesota, Wisconsin, Iowa, and the Dakotas are having some of these pest disease issues, and definitely in the East Coast, too.

A lack of labor is also a critical threat to our long-term viability of American crop production. With the farm labor supply reaching crisis [01:05:30] levels across the vineyards and farms, research is definitely needed in automation, mechanization, and efficient technologies, not only to address decreases in labor, but to enhance our productivity and skills to our existing labor force.

When I'm talking about that, we've seen it more on the harvesting side. We've seemed to get a handle on that, but definitely in the vineyards on the pruning side of things, especially for us from December through early spring, having that [01:06:00] mechanization out there to go ahead and do the mechanical pruning and sensors out there to identify all these different grape varieties and trellising systems that we have across the United States.

Also, extension's vital to delivering scientific outcomes to industry, but it's suffered greatly from a lack of funding. Extension appointments are being eliminated across crops such as growers, for [01:06:30] growers' needs greatly outweigh the agents out there.

Though agriculture and through research initiatives, AFRI and SCRI programs, NIFA has helped sustain this work. More must be done lest this function disappear. NGWI is in step with NIFA. We feel that we know that funding research to respond to these challenges would be considered an investment of our nation's future and investment that will pay big [01:07:00] dividends in years to come.

Federal funding has certainly helped improve the competitiveness of the US grape products. We hope to maintain a strong, vibrant connection with NIFA and the USDA in the upcoming years. Our goal really out there through the NGWI and through boards across the state of Missouri, Wine and Grape Board, our viticulture, Missouri Grape Growers, and our vinifera folks out there, is to avoid duplication of research and encourage research synergies [01:07:30] within the grape industry in the United States.

Thank you for allowing me to speak today, and be glad to take a few questions.

Peter Johnson: Thank you for your talk. I actually don't have a question, but I just want to tell you, since I'm an avid one glass of red wine [01:08:00] drink every dinner, I wanted to thank you for representing the industry and making sure that I always have my one glass of red wine.

Jim Anderson: We are glad that you drink that one glass of wine every night.

Peter Johnson: It might be one and a half. Thank you.

Jim Anderson: Thank you. Appreciate the comment. Thank you.

Megan Haidet: Thanks, Jim. Up next, we have Dr. Daryl Buchholz [01:08:30] from Kansas State University Cooperative Extension. We're doing great with our schedule. We're running a little bit ahead, so after this presentation I'll give you an update about what we'll do with our break. Thank you.

Daryl Buchholz: Thank you. Thank you, and good morning. I first want to take a moment just to thank you for the opportunity that NIFA [01:09:00] provides with this kind of a listening session. My name is Daryl Buchholz. I'm an associate director emeritus, retired on the first of June, for Cooperative Extension at Kansas State University.

I'm a product of the land-grant university system, degrees from South Dakota State, Oklahoma State, and Kansas State University, and then went on faculty as an extension specialist at the University of Missouri for about 13 years in the area of soil fertility and plant [01:09:30] nutrition, before I came back to Kansas State University in extension administration.

My most recent position was that of providing overall leadership to cooperative extension programs, faculty, and staff within Kansas State University and with extension agents in every Kansas county. I've also served in some leadership roles regionally and nationally, and that's really the reason that I'm in front of you today.

As a member and [01:10:00] a past chair of the Cooperative Extension section and its committee on organization and policy within the Association of Public and Land-Grant Universities, and most recently I was elected as a Cooperative Extension section representative to the APLU Board on Ag Assemblies Policy Board of Directors. You get all of that terminology, but if you understand the structure of APLU, you can see where that all fits.

During my service on these national boards, I set forth a goal [01:10:30] of increased collaboration and partnering with the experiment station section, bringing extension and research closer together. I was fortunate while I was chair that I chaired that chair of ECOP with Dr. Mike Hoffman, who was chair of the Experiment Station Committee on Organization and Policy, and together we were successful in bringing research and extension toward a more common agenda, goals, and collaborations [01:11:00] with the various initiatives.

I bring you today a message of the importance of continuing to strengthen and improve such linkages now and into the future. The importance of having the land-grant university system with its shared set of rules and responsibilities and discovery translation and transformational education has never been more important than it is today.

With that background, now I'll respond to the two questions that you have posed before us. Question number one, what's the top [01:11:30] priority in food and ag research, extension, or education that NIFA should address? That question has some very broad, sweeping implications in how one might go

about responding. As our federal partner in providing funding to land-grant universities, I would stress the importance of maintaining a healthy balance of capacity and competitive funding.

As I've listened to presentations this morning, I'm reflecting upon those that we address [01:12:00] because of the importance of our capacity funding and those that we address because of the importance of the competitive funding. It is about providing support to the critical infrastructure of food and agricultural research extension and education.

Capacity funds provide stability, responsiveness, and the opportunity to leverage our human resources to address critical research and extension issues and needs nationally, regionally, and locally. A great example of recent [01:12:30] in addressing a critical issue in Kansas was in responding to the invasion of the sugarcane aphid attacking our grain sorghum fields.

At that time, it was our research and extension faculty who, through that network of land-grant universities and their colleagues, were able to provide the necessary knowledge around scouting, threshold levels, and effective management and control mechanisms. In just that first year, when the pest was identified in high populations in south central Kansas, our innovative educational programs [01:13:00] resulted in a conservative estimate of cost savings and increased production of over \$38 million in that crop season alone.

Capacity funding was a vital source to assist in having the expertise and research knowledge to deliver through innovative extension programming to the farmers, crop consultants, dealers, and agri industry representatives. Capacity funding is also vital to many of our ongoing research and extension priorities at all levels within the system and network. [01:13:30] We work to accomplish one of our goals of developing tomorrow's leaders through the projects and activities for its youth development. That's another great example of the importance of capacity funding.

We are developing tomorrow's leaders in the fields of science, engineering, and technology for the future of a vibrant and strong food and ag system. We reach over 6 million youth and work with them on the importance of the network of specialists and agents and the thousands upon thousands of youth and [01:14:00] adult volunteers that are evident in carrying out that program, working together there providing that kind of experiential learning through curriculum that is juried and proven to be effective in positive youth development. Both leadership and workforce development are natural outcomes of this large-capacity funded priority.

Competitive funds are equally critical to provide the resources to address the increasing complex longer-term research extension approaches [01:14:30] to priority issues. In areas of fundamental discovery and development, competitive funding provides increased focus and productivity towards such discovery.

Great examples of competitive programs include such areas as food safety and security, germplasm development, childhood obesity, natural resources preservation and protection strategies, bioenergy, plant and health and animal health, rural and community resiliency, and the list can go on, reflecting on the priorities of a strong and vibrant food and ag system [01:15:00] in the US and the world.

I'd emphasize the importance of finding focus and allocating resources to address such needs. A few years back, Kansas State University's research and extension underwent a strategic planning process from which five grand challenges were identified as being both crucial to the future of Kansas and appropriately representing the potential strengths of the experiment station and extension service in our state.

Simply stated, those five priorities were water, health, global food systems, community vitality, [01:15:30] and developing tomorrow's leaders. Nationally, through a similar strategic planning process, the Cooperative Extension Section of the land-grant university system has identified the following critical issues where focus of resources and the strength of the cooperative extension system will align well. These critical issues include nutrition, health and wellness, positive youth development, water quality and quantity, food production and security, and community [01:16:00] development.

Question number two, what are those most promising science opportunities for advancement of food and ag sciences? Most promising science opportunities may well be defined in the future of areas of development that are largely unknown at the moment. However, as we think about where those potential nuggets of great opportunity exist, one must think about the opportunity to define and approach problems differently [01:16:30] by burrowing into big data management analysis.

Much of what I've heard this morning goes right back into that kind of a focus on big data management and analysis. Already, we see advances in understanding the knowledge towards effective strategies that come from the analysis of large data sets. Where exactly it may lead us in the future is truly the greatest opportunity in exploring new approaches to discovery and ultimate solutions on our critical issues.

[01:17:00] Continued emphasis in multidisciplinary research and extension methodologies is another area that has great opportunity for the greatest advances. Multidisciplinary approaches to the areas of nutrition, diet, and health strategies represent one area of great opportunity in addressing an ever-increasing cost of what is deemed as the necessary health care system. Finding new and innovative ways towards long-term improvements in the health and well-being of society will only happen [01:17:30] through multidisciplinary approaches.

Finding strategies for sustainable intensification of food production in developing countries is a promising area for research and extension to provide for ever-increasing need of food security across the globe. At the same time, the opportunity to create more resilient agricultural production systems to meet the increasing variable and extreme weather patterns is sorely needed.

Changing weather patterns result in a need for new and different [01:18:00] approaches to food and ag production that will withstand such stresses and provide for the ever-increasing demands in food and agriculture production and technology. Tied to that thought, strategies must be explored to provide for long-term solutions to such problems as anti-microbial resistance. Anti-microbial resistance represents an area of opportunity whose greatest outcome may be a healthier food and ag system and society as a whole.

I appreciate the [01:18:30] opportunity to provide this input on behalf of the Extension Committee on Organization and Policy within APLU and overall Cooperative Extension Section. Cooperative Extension brings a strength of research translation and transformational learning to the issues and challenges, serving citizens all across this great land through our land-grant university system. Thank you.

Megan Haidet: [01:19:00] Thank you. We had planned on taking a break from 10:10 to 10:30, but I would like to invite any speakers that did not get on the agenda, if you would like to have an opportunity to speak, we have a few minutes. [01:19:30] If not, we'll present this opportunity later in the day. I think what we'll do next is take our break now. We have 20 minutes to take a break, use the facilities. We have some light refreshments out front, and we will resume at 10:10. See you then.

Megan: Well, for those of you just tuning in, we had a great first part of our morning with a number of speakers that represented national associations, statewide organizations, down to local organizations. I really appreciate everyone coming out, and hope that you're also contributing via our online portal. If you have any written statements that you'd like to submit, those will go [00:00:30] into our official record as well. So if you have transcripts or abstracts from your presentation, please pass those along throughout the day.

Next, we will have Jesse McCurry, from the Kansas Grain Sorghum Producer's Association.

Jesse McCurry: Thank you very much. Welcome to Kansas. We're all glad [00:01:00] that you chose to come to the major sorghum producing state. And since you're in the heartbeat of production ag, just want to share as well that the farmer organizations like Kansas Grain Sorghum and Kansas Wheat, for that matter, are earnestly seeking relevant research and technology to support stewardship and sustainability in the countryside. I'm Jesse McCurry, I was raised on a beef and grain operation in south central Kansas. My wife Rhonda and I are eagerly raising four young [00:01:30] ones and trying to teach them about their

ancestors' heritage in showing and 4H and livestock, and when we're not fully chasing kids, I'm honored to represent farmers as executive director of the Kansas Grain Sorghum Commission and Association.

Our organization represents Kansas sorghum farmers. We're trying to improve profitability, which is difficult at this particular point in time, not only through advocacy market development, but education research and promotion. We invest in research ourselves through farmer checkoff [00:02:00] dollars, and we're the voice of sorghum. Our farmers are active and passionate about their crop.

I tried to get a few of them to come here today, but they're quite eager to get harvest wrapped up this year. NIFA has the capacity an ability to reinvigorate the cropping system. Private research and development has invigorated specific cropping tools but the focus, appropriately so, has been on return and investment. Crops that have a perspective 90 million acre plus opportunity [00:02:30] have been the center [inaudible 00:02:31] for crop improvement and new technology. But farmers need diversity and farmers need cropping system stability and farmer's new work horse crops like sorghum that would yield rain or shine. Crops that lack that major 90 million acre threshold opportunity have been left behind when it comes to new, novel field level advancements. This in turn has left the entire system diversity behind.

Sorghum is planted on nearly 6 [00:03:00] million acres, and has the genetic diversity to be a solution crop for tomorrow's challenges and opportunities. The most promising science opportunities for broader system level impact is transferring crop system advancement technologies to crops like sorghum. Increasing diversity equals increase long-term resiliency and productivity in the farming system. Further the viability of farming operations in to the future generation requires access to relevant technology and weather hardy crops. Your [00:03:30] organization and partnership with Kansas State University for example, can strategically fill the cropping advancement gaps left behind by private industry to reinvigorate the ag ecosystem and mitigate challenges caused by monoculture production systems.

There are two veins of promising scientific opportunities. One is leveraging genomic enabling cropping advancement, and two is exploiting natural occurring diversity. For unique grain properties and enhanced agronomics. [00:04:00] Cropping advancement, as you know, is a numbers and odds game and we have the opportunity to stack the deck in our favor with integration of genomic enabling tools. With the focused research effort, we can translate sorghum's untapped natural genetic diversity to highly valuable commercial opportunities and agronomic advancements with potential broader outcomes in the closely related industry due to comparative genetics. Farmer leaders are [00:04:30] eager and willing to partner with the merging research opportunities with their investments in time. Whether it's serving on research advisory boards, or establishing new collaborative research platforms, we are wanting to be part of the system and be at the table.

In fact, recently, Kansas sorghum farmers joined with Kansas state to establish the collaborative sorghum investment program or CSIP a farmer driven organization for trying to advance sorghum across the breath [00:05:00] of public and private capacity building. Our farmer driven sorghum investment stands ready as a primed partnership to further invigorate meaningful research and to provide for translational science with better outcomes.

Thanks again for coming to Kansas, the heartbeat of production agriculture, and trying to integrate our messages here into your broader priority and vision. With that I'll take any questions.

Thank you.

Megan: [00:05:30] Thanks Jesse. Next up we have H.C. Russell Junior.

HC Russell: Good Morning. My name is H.C. Russell, I'm from Clark Missouri and I consider myself [00:06:00] a grateful beneficiary of the land grant university system. I hold a Bachelor's Degree in Agriculture Economics from the University of Missouri, and currently employed as an area credit manager for an agricultural cooperative, MF Incorporated, headquartered in Columbia, Missouri.

As an advocate, I'm currently an elected member of the Boone County Missouri extension council, I represent that county extension council in the northeast Missouri regional council. I represent that [00:06:30] regional council at the University of Missouri extension state council and have had the privilege in the last few years of serving as the University of Missouri extensions delegate to CARET, the Council for Agricultural Research, Extension, and Teaching, which is a committee of the APLU. Beginning in January, I'll begin serving a two year term on the national executive committee for the CARET organization, I'm looking forward to that challenge realize I still have much to learn there. I'm coming today primarily as an advocate [00:07:00] that is both a consumer of extension services, both in a personal light and professionally and hope to participate in a way that makes that organization better and stronger. I'm going to reverse the questions today, on our most promising opportunities for advancement of food and science. Again, I'm coming from the non-scientist in the room.

As a layman, my thoughts are mostly based on anecdotal observations, [00:07:30] interactions I had with other people, trade journals, things that I see within the industry that I work and just general interaction. I believe feeding ourselves in the future will require more than food production, while we need to continue to improve food production by volume efficiency, resource utilization, nutritional value, and all of those ways we can, we've also got to find better ways to make it available. These advancements need [00:08:00] to include processing, preserving, storage, logistics, economics from the beginning of production all the way to the consumer. I believe much of the world's hunger could be lessened sooner by better economics and logistics than necessarily our innovations in genetics and production.

The most exciting scientific discoveries, I think, are probably coming in the genetics and the productions as many of our presenters have talked about earlier today. The most efficient impact toward our goal of feeding [00:08:30] people, I think, has to include advancements in getting the food to where the people are. I'd like to go back to the first question, my top priority for food and agriculture research extension and education and where I hope NIFA can help address those issues, mine comes back to a very fundamental thing, to educate people we need educators on the ground. Capacity funding sometimes called formula funding is a bed rock of extension education in the country where our educators [00:09:00] meet those that need our services the most. Application of research based information is critical mission of our land grant universities. Delivery of much of this information is still best accomplished by educational professionals working directly with those in need of the information. The capacity or formula funding provided through NIFA in this Cleaver area is critical to the support of the educational professionals and the delivery of the research based information they have available.

Federal [00:09:30] funding to land grant universities has remained almost flat for over two decades. Even with low inflation that we've experienced over the last couple of decades, the purchasing power of those funds has diminished by at least a third. At the same time we've had inflation of salaries and other expenses in higher education of bringing those services forward, the result of that is the number of extension specialist in Missouri has fallen from just over 400 in 1968 to roughly 230 heading in 2018. [00:10:00] Land grant universities both extension and research enterprises have gotten more efficient during that time and remain very good stewards and multipliers of public resources invested there. However the long term decline of investment and public education, extension education, has a negative consequence now and will have for years to come unless we can reverse that trend.

A recent study found the University of Missouri Extensions economic impact in the state of Missouri total almost \$ [00:10:30] 950 million. That impact begins from NIFA's investment of approximately \$10 million dollars in University of Missouri extension. There are other funding partners, of course, they include state appropriated funds, county appropriate funds, contacts, gifts, fees making the total budget for the operation of about \$84 million. It all starts with that public investment through NIFA of \$10 million dollars.

At the risk of being repetitive, I want to run through those numbers again. We start with \$10 million dollars [00:11:00] of public investment through NIFA, for a then result in overall economic impact of almost \$950 million in Missouri alone. As our partners in NIFA strive to make the best decisions possible for the allocation of the public resources we're entrusted with, I hope this extraordinary impact is a major factor in the evaluation process. Imagine the difference we can make in fellow citizens with just a little bit more investment. I look forward [00:11:30] to ongoing support of NIFA and from NIFA, and hope to help in any way I can and for those that are partners there within NIFA, if you know of a way that we can help from the advocacy role outside of the organization, I hope

you'll get to us and share that cause and the direction we can go to help you. Thank you. Questions?

Speaker 4: Hi, Mr. [00:12:00] Russell, thank you for coming today and I'm delighted to hear that you're going to be so active in CARET because we need voices like yours. I just want to reemphasize a point you made, which is, of course, that while we invest in increased productivity and that is really, really important, we need to feed more people. But we need to think about how's it going to get to them and is it going to be delivered in a way that will be sustainable and that they will accept. All of that end of things. The critical role of extension in there, in translating the research, so often it's like we need to increase productivity, [00:12:30] absolutely, but there's more to the story. We need to keep telling the more to the story. Again, I'm so glad you're on CARET because you're one of the many people we need to keep telling that story. We're saying it in DC, we want it to continue to be said at every potential, former and the country. Thank you.

HC Russell: Thank you very much. Anyone else? Thank you.

Megan: Just another quick announcement, if you've joined [00:13:00] us during the break and have a PowerPoint to upload, you can speak with Erin in the back. Next up we have Robert Terry from Oklahoma State University and he might be representing a couple organizations here today.

Robert Terry: [00:13:30] Good Morning. I am Rob Terry, I'm the Department Head of Agricultural Education, Communications and Leadership at Oklahoma State University, I have come today representing primarily the Experiment Station Committee for Agriculture Education Research, I'm the past Chair of that group and I also serve as President [00:14:00] of the American Association for Agricultural Education, so my comments today are related to some work and some priorities and concerns that we have for those two latter groups.

First of all I do want to, as other speakers have said, express my appreciation for this opportunity to be heard. I commend NIFA for holding these sessions, consider it be very valuable and a great opportunity so Dr. Qureshi and Dr. Ramaswamy, we really appreciate this opportunity. There is no question that [00:14:30] continued advances in areas such as soil health, plant and animal breeding, pest control, nutrition, water management, et cetera are critically important to our sustained existence on this planet. However it's equally critical for us to appreciate the impact of the human interface with food and fiber production. The groups I represent want to impress upon NIFA the need for us to commit resources and effort towards [00:15:00] social sciences research. I have four important points I'd like to share with you this morning.

First, we must gain a better understanding of what stakeholders for agriculturist, so we're talking about everything from policy makers to consumers and all the special interest groups represented within that range, know or at least think they know about agriculture. [00:15:30] Also, we need to understand what people generally feel or if you will, perceive, about modern agriculture and

food production. We're all aware the misconceptions that exist regarding GMO for instance and animal agriculture production. We need to understand where those perceptions have been developed, how people gained this knowledge that they perceive they have, more importantly we need to develop educational and communications programs to address those issues [00:16:00] and apply the solutions through social organizations such as educational institutions, businesses, agribusinesses and other forms of business, governments and let me emphasize here that there are great opportunities now for the public and private sector to work together toward solutions, towards communicating with the public about agriculture and then other social systems that exist around us. There are tons of opportunities there.

Secondly, [00:16:30] we recognize the value of multidisciplinary approaches. There's great potential for addressing our grand challenges through collaborative efforts between social scientist specializing in educational communications when they team with bench scientists. Multidisciplinary, multi-state efforts offer this opportunity for synergy to address these complex issues. Opportunities need to be created [00:17:00] to promote agricultural facility working together across departmental lines across institutions, across state lines to focus on the solutions we face. This needs to happen with facility through their functions as researchers, certainly, but also as teachers and outreach/extension specialist.

Third, we've heard it said that one of the best expressions [00:17:30] or illustrations of a person's values or how they spend their time and how they spend their money. The same thing can be said of societies at large. Much support for social sciences research to this point has been in the form of, if you will, a tag on to existing programs. That's a step in the right direction, no question about it, that didn't exist whenever I first got into higher education, so NIFA is to be commended for that, but we would think [00:18:00] things need to go a step further, that we need to have more programs that are developed and promoted effectively with facility in these areas that focus on human capital development, everything from career readiness of young people to work in agricultural careers as well as what I've talked about before with forming and understanding perceptions about agriculture.

Finally, we must have a concerted effort towards developing and delivering programs to increase [00:18:30] science based knowledge about how food and fiber are produced. People need to understand, and we need to address specific issues with our public about how agriculture impacts their human health, our collective economic well-being, our societal sustainability, and that's bringing in the whole issue of food security, energy production, alternative energy specifically, and [00:19:00] environmental sustainability. Factors you see also that are inherit with that include important issues that are going to continue to become more and more important such as water quality, soil properties, maintenance of nature areas and so forth.

As I wrap up, I'll tell you that we submitted a couple of documents that'll be with the materials we have. One, a white paper summarizing opportunities that this committee for agriculture education research sees, we just put [00:19:30] that together recently, working together. I'll tell you that committee's made up primarily of my counterparts, department heads from across the country. Also, uploaded a summary of the research priorities by the American Association of Agricultural Education that we just adopted for the current five year period. We offer those as things that we bring to the table, things that we can offer NIFA and the kind of programs we feel like we'd like to see emphasized. With that, I'll again, thank you for holding this event and thank you for listening.

[00:20:00] Any question?

Speaker 6: Thank you. Thank Dr. Terry for a very informative, very informative presentation, what really interests me from your comments is that, yes true, NIFA is a very production agriculture skewed agency, that's our center of gravity.

Robert Terry: Correct.

Speaker 6: However, [00:20:30] your point is right on the money, human dimension has to be integral part of production agriculture. It's so interesting that when we had our internal listing sessions from our own staff, one of the things, which became the top priority or came out to be as top priority was actually human dimension and social sciences' aspect. Over the last few years, NIFA actually has evolved into, [00:21:00] not just a biophysical, sciences, but also building subject matter expertise in house in social sciences as well. Now we have, actually, on staff PhD level experts in social behavior and economics. In fact, we have a small working group, we call it SBE Working Group, which actually informs, like Peter Johnson and Denise [00:21:30] and their staff who have more production and agriculture that these are the social sciences nexus to what you're doing. Points well made, very cutting edge, and very contemporary and we appreciate you bringing this up.

Robert Terry: I want to acknowledge that we do recognize the progress that has been made in the last few years and this committee I mentioned, we've met in DC twice in the last five years and some of your staff has meet with us, we've been over in your building talking [00:22:00] to you to your group and we have seen progress on that, we just want to make sure that continues to be an important part of emphasis of NIFA programs in the future. Thank you.

Speaker 7: Another thank you from me, but also it brought up in my mind a real life experience and how what you have shared with us is so true. I'm [00:22:30] involved two competitive awards that are working in different regions of the country to help sustain the dairy industry, one is in the southeast and one is in the north central. The focus of these two awards actually was not on research, they were made with the focus on extension, it was called the Extension Focus Solutions for Animal Diseases and the fascinating [00:23:00] story that's come

out of both of these, they're finishing their five year life up now. Fascinating stories that the animal scientists on both teams, as well as the veterinarians on both teams have had their eyes opened much wider because they included social science.

Robert Terry: Wonderful.

Speaker 7: And social scientists, so what I hear back, what I've heard over the last couple of years is 'wow. [00:23:30] We have this good information that we know could help the producers now, while we're looking for the next innovative solution that'll take us further but guess what? We've figured out and found out by working on the ground interviewing the owners, those who manage the herds and the workers [00:24:00] finding out there's distinct separation of understanding and interaction between those three groups and how we've had to do this intervention and now all three are on the same page. They've come up with some really interesting ways to involve the workers on the ground that are actually doing the hard labor and [00:24:30] it's all because they involved the social scientist.

Robert Terry: Great, good to hear. The aspect of all of us in agriculture, internal, pull the rope in the same direction is important as well, and that's the social sciences' aspect. Thank you.

Megan: This is the point in our agenda where I'm not sure the [00:25:00] next speaker is here. In fact, I know he's not. He's driving and probably won't make it. Is Dr. David Ertl here? Wonderful. Then after this, we'll have an opportunity for any unscheduled speakers to come on up and say a few words or make a presentation.

Dr. David Ertl: [00:25:30] Good morning and thank you for giving me the opportunity to speak this morning. I'm here representing the Iowa Corn Growers Association and the Iowa Corn Promotion board but really I'm here to discuss a top research priority of our corn farmer members and those who may our corn check off. As Dr. Jeff Mohan mentioned this morning, next Friday represents the 20th anniversary of the signing of the legislation funding the national plant genome initiative. This was a landmark [00:26:00] legislation and it's still functioning today in terms of generating genomic information, the corn growers across the country were instrumental in getting that legislation drafted and pushed through and I give them a lot of credit for the foresight that our farmers have in understanding the important when they heard about the human genome being sequenced, asking the question "why can't we do it in corn?" And we did. We've done it in a lot of other crops since.

[00:26:30] It didn't stop there. Once the maize genome was sequenced in 2009, it immediately began asking what's next. How do we take this book of alphabet letters and turn it into improvements on our farm. In visiting with the public and private researchers, it became apparent that the next step was we need to generate field phenotype data and trait information to correlate with this

[00:27:00] genetic database. Ever since the genomic sequence, we began this next step in the journey of turning that genome information into functional genomic information.

A tremendous investment has been made in genomic research and we're now looking for additional research emphasis in the area of [00:27:30] translating this into this functional information. As we all know, the economic important traits and crops are the function of their genome and the environment in which it's placed. Those traits are expressed as a result of that genotype environment interaction resulting in the plants, phenotype or collective assembly of its phenotypes. Understanding the role of these genes with their environment [00:28:00] is going to allow researchers to better design and predict performance of plants even before they're created and allowing us to make more rapid improvements in crop varieties and hybrids.

As we face additional challenges from the environment, water availability, nutrient availability and so on, genetics offers one bright spot of hope for improving our [00:28:30] productivity and resisting these challenges and headwinds. The research that we believe needs to happen is development of tools in the fields such as high throughput phenotyping sensors and to go along with that then we're going to need these tremendous databases to handle the large quantities of data generated. No longer we just measuring ACTs and Gs in the genome alphabet, [00:29:00] we're now collecting terabytes of data from very inexpensive cameras, videos, who knows what else, different formats of data that are very large and are going to require a totally different way of thinking about databases. Then once we get the datasets assembled, we're going to need new tools to analyze those and interpret those to extract the important information from those.

This kind of research is no longer just [00:29:30] going to be the realm of plant scientists, it's going to require bringing in disciplines such as computer science, engineering, climatology, crop modeling to fully leverage this information. Of course, I'd be remiss to not also mention the importance of training. This will provide a great training platform for our students of the future, and scientist of the future [00:30:00] to have the breath needed to be successful in their fields.

No longer can you just study physiology or plant breeding, and be able to function in this new world. I mention this is important to our corn growers and I want to highlight that corn growers from across the country have invested more than \$3 million of their own checkoff dollars in the last few years to initiate a maize [00:30:30] phenotyping initiative called genomes to fields. This has resulted in a wide scale testing networking of more than 20 university and 30 scientists from the maize breeding and maize genetics communities coming together to generate phenotype data from thousands of genotypes across more than 100 environments so far. This is just to kick start this effort into generating [00:31:00] in phenotypic data to go along with all the rich, maize genome data. This is just a start, it's certainly not enough to fully leverage all that genomic information and so what we're requesting that NIFA look strongly into this area

of generating the types of tools data steps, skills necessary to leverage the genome information.

I'll just conclude by a little person anecdote. [00:31:30] I began working for the Iowa Corn Growers in 2011, which was just two years after the maize genome was sequenced. On the very first day on the job, Pam Johnson, who's the corn farmer from Iowa, Iowa Corn Board member, as well as former President of the National Growers, came up to me and said what do I think about phenotyping? And I'm telling you that because this is definitely a farmer driven initiative. Those [00:32:00] of us at the associations are pushing it forward, but it's through the drive and determination of the farmers themselves and again their foresight. To wrap up that story, I said of course, phenotyping's very important being a corn breeder myself. I do want to emphasize that this is something very important to farmer's themselves. With that I thank you for giving me opportunity to present and thanks for listening.

Megan: Are there [00:32:30] any questions?

Speaker 9: Thank you very much. Just sort of a follow up question on big data. Big data is a very broad term used in many different ways, so the first image and I'd like to sort of get your insight on is when you're a producer, your grower is looking at this problem, they're looking at it as tools that they need to make sense [00:33:00] out of what's going on in their fields to optimize their production or their looking at it as tools that the researchers need to really sort of help improve the pipeline opportunities for them. The second question is sort of related to that, which is what are the needs? Are the data tools needed generically or are they needed specifically to translate to specific crops. You know what I mean?

Dr. David Ertl: Mm-hmm (affirmative).

Speaker 9: Where do you see the gaps?

Dr. David Ertl: The first question, I probably should specify there's both are needed [00:33:30] at the research level and at the farmer level for managing and analyzing big data. Those are somewhat separate issues but there's actually some interest among university professors of obtaining farmer created data as well to help build up our database of phenotype information. I do believe that some of these tools that will be developed for research purposes will get translated to the field perhaps more in a sensor area. I can see some immediate applications [00:34:00] to some of these research tools that we're developing, being deployed relatively quickly on farmer implements to also measure those traits within the farmer fields. Definitely I see an issue both on the research side and the farmer side. Farmers are at the point where they can begin collecting big data on their own farm, but there really aren't very many good tools yet available.

Second question ...

Speaker 9: Of a generic [00:34:30] sense of the tools or is it very specific use.

Dr. David Ertl: Some of each, some of these are tools we believe such as data analysis tools to dig into analyzing genotype by environment interaction can go across crops. Certainly when you get into crop modeling area that's going to have to be more specifically developed, I think they'll probably be some generic modeling tools perhaps, but to translate it to a specific crop, quality of grapes is going to be [00:35:00] a lot different than yield in corn so we'll need some specific modeling tools at that level. All right. Thank you.

Megan: Any other questions? Thank you. All right. Next we have Jason Ross. NIFA is always listening throughout this period, so if [00:35:30] you want to show up the day of and load up a PowerPoint we're happy to hear you. Jason is from Iowa State University.

Jason Ross: I would also echo what many people have said and that's thanks for the opportunity to share some of our perspectives and my perspective. I'm a faculty member at Iowa State University. I'm in the College of Agriculture and Life Sciences and also in the Department of Animal [00:36:00] Sciences. In addition to that, I serve as the Director of the Iowa Pork Industry Center and in that role work closely with a lot of stakeholder and producer groups including the Iowa Pork Producers Association, the National Pork Board, and just a lot of livestock producers throughout the state of Iowa and the Midwest.

A little bit about the College of Agriculture and Life Sciences, these different bullet points here kind of recognize some of the highlights, some of the research thrust [00:36:30] areas where we have really strengths in faculty programs and so NIFA has long invested into our college and into our university and has helped support tremendously already faculty programs and teaching research and extension and these different areas. We have about 5,300 undergraduate students in the college, about 1,150 of those would be in the animal sciences. [00:37:00] We have a large impact on training the next generation of innovators, the next generation of scientist that are going to not only have an impact on U.S. agriculture but on global agriculture in general. Towards the bottom here you can kind of see some of the other areas, big data and within big data is precision livestock farming and just other areas that are beginning to become newer and innovative pushes in our faculty programs at Iowa State University.

[00:37:30] When we look at grand challenges, they're not too far different from what things have been said in this room already. In looking at the global population in 2050, we know what the predictions are for the number of people that are going to be in the U.S. and globally. What we also know is that the arable land mass is not going to increase substantially in the world, and at least not proportional to [00:38:00] the global growth. That creates a significant food and nutrition security issue and as you guys all probably know, food security is a

major contributor to other acts of peace in different regions in the world. It's very dependent upon food and nutrition security.

Obviously, [00:38:30] also the impact on environment of production agriculture is a core to many of our faculty programs, the impact of agriculture on human health, you guys have probably seen a lot of the literature that comes out and what I'll show you here in a little bit is just the importance of animal agriculture on human essential nutrient production and it's role in the whole system, the whole agricultural system for food production in the world. Then, obviously just energy is [00:39:00] another major challenge that we'll have to face moving forward. A lot of that can be captured, at least in my mind, in sustainable intensification of agriculture recognizing that everything that's been said already with respect to improving efficiency, plant genetics, plant phenomics, and improving yields per acre of arable land is critical feeding the world. What I would also suggest to that is [00:39:30] that animal agriculture is an integral part of producing enough essential human nutrients, protein and other amino acids, vitamins and minerals available to humans.

This is from a review paper but obviously we know that there's a substantial part of the world that is food insecure, but kids in the U.S. are not immune to this as well. There's a significant number of children [00:40:00] in the U.S. that are protein insecure. There may food but they're protein insecure throughout the U.S. and it's exacerbated throughout the world. That has significant impacts on growth and development both from a neurological standpoint but also from a physical standpoint as well. This is just a graph that I put in here that's created by Dr. Dale Bauman, who's from Cornell University, retired faculty member that's in the national academy and this is a highlight from a talk [00:40:30] I saw him give looking at an index that calculates production, nutrient density production in relation to greenhouse gas emissions. What this says, and I should have tried to edit this out of here out of the wine talk so I apologize and I'm not trying to make anybody feel guilty if you drink a Mountain Dew or a beer later on the way home, hopefully not the beer on the way home.

The point being is that the inclusion [00:41:00] of animal agriculture and milk production in this scenario is that the product, the nutrient production per acre or per greenhouse gas emissions is substantially improved relation to other agriculture products. The point being is that animal agriculture is a critical component moving forward for the next 20, 30, 40 years that we need to start looking at whole system agricultural production and how plant and animal production [00:41:30] efficiencies can be intertwined to improve overall availability of food security and nutrition security for a growing global population.

Again, this is kind of just the last slide where I've summarized a couple things from a question of where should we be prioritizing research, I think we need to be prioritizing research and whole system agricultural approaches that maximize human essential nutrient production. [00:42:00] In that approach that recognizes that we need to maximize plant yields where we can maximize plant

yields but we also need to maximize human essential nutrient production through animal agriculture. Animal agriculture is an efficient mechanism to convert plant material into human essential nutrients, more efficiently in many cases on a per acre basis. I think that's critical component to adequately efficiently [00:42:30] and sustainably feeding the world.

To do that, there needs to be substantial research based advancements, we've talked about research based solutions in new areas, not only in plant agriculture or only in animal agriculture but as they relate to each other and the impacts of environment on ... We just heard about the interactions between genes and the environment and plants and the implications of that, I would say to take that further and evaluate [00:43:00] that, how does that impact the quality of that feed to influence a dairy cow's ability to produce milk and the quality of that milk as well as a pig to produce bacon and pork chops and the nutrient components of that animal product.

The other thing that's critical, there's a lot of things that go into that research based advancement, precision livestock farming, precision farming has been [00:43:30] generating great advancements in the last 10 or 20 years, but precision livestock farming is also something that will enable us to continue to have sustainable intensification, where we improve animal production while diluting the fixed prices or the fixed cost of animals by improving their efficiency and part of that is through collected substantial amounts of data and processing data that will enable monitoring of animal welfare as well as monitoring [00:44:00] just animal productivity in general and their interactions the environments that they're in. That covers a lot of different areas from engineering to physiology to nutrient management.

Also we've heard it a few times today, just the development of future leaders in agriculture in research innovation, there's only a few Norman Borlaug that come through the world and the next one may not be in this room. I'm pretty [00:44:30] sure it's not me. We need to continue to invest as you already have but continue to advance those investments into the development of future leaders. We have every four or five years about 5,000 undergraduate students come through the College of Agriculture and it's our hope and aspirations that those students are going to go on and be the innovators of the next solution to feeding the world. We need to continue to give to those students those [00:45:00] opportunities to get them into the research opportunities to help foster and develop their innovation.

Collectively that results in basic and applied sciences that translate to diluting the fixed effects or the fixed cost of agriculture through sustainable intensification so production efficiency in livestock and in crops is how we dilute those fixed costs by maximizing our yields on, over the cost of [00:45:30] maintenance in an animal and over the cost of an acre in plants.

Oh, my apologies.

There's a lot that goes into that, but that's really what I would advocate for is just a larger system approach recognizing with the goal in mind of maximizing human essential nutrient production through plant and animal agriculture. [00:46:00] I guess I'll stop there and open it up to any thoughts, perspectives, questions.

Sure.

Speaker 11: Thank you for your presentation and I think we're seeing a theme here. It's we need to, as we're increasing productivity make sure that we're answering the questions at the end of the chain. Is it sustainable? [00:46:30] Is it nutritious? Is it, all of the rest. Do we have the next generation coming along? I was making a note and I think almost every speaker has touched on the need to train the next generation. This is great, this is really great and you're really in line with what we're thinking but you're adding a great dimension to it and given us the perspective. This is really great, thank you for this presentation.

Jason Ross: Thank you.

Megan: Thanks.

[00:47:00] All right. Anyone else? Would anyone else like to add a comment today?

All right. Oh. Come on up. Wonderful.

Dr.Doug Jardine: [inaudible 00:47:27]

Megan: Good. [00:47:30] Can't help yourself for one last thought. Well, they'll be some final thoughts.

Dr.Doug Jardine: I'm an extension guy, I can't turn away a microphone. I'm Dr. Doug Jardine, I'm an extension plant pathology with the Kansas State University and I'm actually here today because for the next several weeks, I'm the acting Assistant Director for Ag programs, and Dr. Greg Hadley, my boss, sent me here today to listen and take notes. He doesn't know I'm up here.

I [00:48:00] would like to just say a few words about integrated pest management. One of my past jobs at Kansas State University is I was a State Integrative Pest Management Coordinator. I think we all know that the public is usually concerned about pesticides in their foods, whether they're fungicides, insecticides, herbicide residues, glyphosate, there's lots of misinformation about some of these products out there. A couple years ago, I had the chance to serve on the grant panel that distributes funds for integrative pest management programs across [00:48:30] the country and I can just tell you that there were way more great ideas than there were funds to supply them all. That has become a competitive process, those states that wrote the best proposals got

the best money, but that doesn't mean some of the states whose proposals weren't quite as good, some of their ideas were really probably deserving of funding. They just maybe didn't do a good a job presenting them as some of the other states did.

[00:49:00] I would think that an investment, increased investment perhaps in funding for the integrative pest management programs across the country would be a really good idea. Both in competitive research funds in integrative pest management as well as capacity funds that we've heard. I know, one of the areas that some of my colleagues deal with it are, and we've seen it in particularly the [inaudible 00:49:24] is resistance from the pest we're trying to control. It's a huge problem with a number of [00:49:30] different weeds, there is a number of insects that are resistant to many classes or compounds. I can tell you there's a very important disease of soy beans called frog eyed leaf spot. A field that has never seen a fungicide after a single spray of a strobilurin fungicide, we can recover resistant isolates that the fungus is that adapted to overcoming resistance.

One of the ways we can deal with resistance with these diseases is through breeding and [00:50:00] certainly as several people have mentioned breeding today. The importance of breeding in the public sector is ... I was at a meeting within the last year and there was an employee of a major seed company and the discussion was around breeding for disease resistance. The person said "Well, you know, diseases are a once in a while thing but yield is an every year thing." That particular company, their focus is entirely [00:50:30] on increasing yields and they really don't give very much thought to disease resistance, so if that's not happening in the private sector, maybe we need to do some funding in the public sector so that where profit isn't important we can develop the germ plasm with the resistance genes in it, and maybe unlink them from negative traits and then turn them over to the private companies for development.

I think that's kind of what I had in mind here today. I would take a question.

Megan: [00:51:00] Thank you Doug. If that is the end of our public comment, I know we have a few more comments from NIFA. Dr. Peter Johnson has some ideas for [00:51:30] some summaries, and Dr. Quereshi will finish. To those of you that are viewing this online there are three more opportunities to comment in public, next week on Thursday we'll be in Atlanta, Georgia. The following Thursday, November 2nd we'll be in Sacramento, California and on Wednesday November 8th we'll in Greenbelt, Maryland. You can [00:52:00] find more information on our website, www.usda.nifa.gov/nifalistsens

Dr. Peter Johns: Okay, this ad lib so we'll see how it goes, but I think it's going to be fun. This is concluding story for me about Fred and Mary. The nice thing about Fred and Mary is [00:52:30] that Fred and Mary have spent their life working in agriculture. It's kind of hard to believe, but having heard those that came to the podium today and spoke about your different areas of interest concern and

need, Fred and Mary were involved in many if not all of what we heard today. Now let's hear [00:53:00] about Fred and Mary.

It actually, and it's a happy story, but the way it starts out with, you might say "Oh this doesn't sound so happy." Fred and Mary turns out, they passed away, they actually died within a few days of each other. Don't worry, they both made it to Heaven. Fred and Mary arrive into Heaven just about the [00:53:30] same time, in fact so close that they walk in together. There's this beautiful angel that meets them and says "Welcome to Heaven, Fred and Mary. Wait until you see what we have prepared for you." So the angel brings them to this incredibly huge mansion, now mind you, Fred and Mary were involved in agriculture and they worked really, really hard. But [00:54:00] they were never rich people. Let's face it, if you want to make a lot of money, you don't necessarily work in agriculture, but Fred and Mary did it because it was their life passion. They raised their family on the farm.

So here they are in Heaven and they arrive in this mansion and the angel says "Okay. This is yours. This is yours." And looks at what's inside and it is better than [00:54:30] the best looking mansion you could imagine. There's living rooms with gold sofas, but they're comfortable. There's living rooms with silver chairs, but they're comfortable. There's bathrooms all over, because remember they're elderly now they've been married 60 years. There's anything you want. So the angel says "Okay, Fred. [00:55:00] I understand that when you were alive, you really liked wine. You loved wine. Well, look out the back. You've got your own private winery. Okay? And those grapes on the vine, you don't need mechanization to harvest them. The angels will harvest them for you, all you have to do is pick the bottle [00:55:30] wine that you want, welcome to Heaven."

Then the angel says "And you also always loved looking at your cornfield, well you look out that window. Look at that gorgeous, gorgeous corn field. And once again, you had some beef cattle and you had some pigs, you don't have to harvest [00:56:00] that corn. The angels will do it for you. Look out that window, you've got the beef, you've got the pigs. And Mary. You always wanted fresh eggs, look out that window, you've got your chicken coop and you never had chickens because your husband said he wasn't going to clean the coop, but this is Heaven. Angels [00:56:30] clean the coop. That's yours. You got fresh eggs every morning. Now look out that other window, you have a wheat field because Mary you love making bread and now you'll have your bread made from your wheat and Fred, you don't have to do anything, look out that other window." This a huge mansion with lots of windows, [00:57:00] okay? "Look out that window, there's a grain..." What do we call those? Grain ... Silos ... No, but where they ... Granary. "There's a granary. So guess what? The angels do all that, you'll just have the fresh wheat from your wheat fields brought to you and you can make all the bread you want. Oh and don't [00:57:30] forget the sorghum, because you're going to feed some of that to your animals. Wow."

Mary's really, really happy, but Fred interestingly starts getting angry. At this point, by the way the Angel has left, says "I'll come back. You got more stuff coming. This is only the beginning. Just settle in." And Fred says to Mary, he says "Mary I am so upset." [00:58:00] Oh my gosh, I hope I woke you up if you were tired. "I am really, really angry at you. So angry." Now Mary is taken aback because they've got their dream come true. And so Mary says "Fred, I've loved you for 60 years, you've never got this upset at me, why are you angry at me now?" And guess what he said? He says to her "Mary. If it hadn't [00:58:30] been for your healthy food, I would have been up here years ago!"

I just tried to pull you all into the story in different ways, I couldn't pull all of you. Regardless, we do support healthy eating because it's one thing to be in Heaven, it's another thing to make Heaven on earth. We do want healthy eating. Thank you, I really had fun here, and hope you did too.

Dr. Qureshi :

[00:59:00] Dr. Johnson was able to bring human dimension into all this at the end of the session. Thank you Peter. Thank you all for being so engaging since 8:30 this morning. The fact that you all showed up in person really [00:59:30] made this session very successful in terms of the intent we had. We heard a lot about NIFA being your partner. That is important but we think it is more important that you are NIFA's partners. That's the value we wanted to derive out of today's morning session. [01:00:00] Where do we go from here? But before I do that, what have we heard?

We have heard a lot of excellent ideas. I've been taking a lot of notes, we have also been recording all this and we are two, three redundancy built into recording mechanisms so that we don't lose anything, what we heard today. We sort of heard about the [01:00:30] science aspect of production agriculture, we heard about the extension aspect of product agriculture. We also heard about the human dimensions, we heard about education, we heard about the need to train farmers. We heard about the next generation of scientists, we heard about the value, which [01:01:00] we should and must derive out of all these enormous genome sequencing we have done over the years.

How can we use this high throughput technology and the big data, which is coming out and how can we take this genome to phoneme? We've heard about specialty crops, we heard about sustainable intensification of agriculture, we heard about engaging youths and positive youth [01:01:30] development. Precision farming, future leadership, we heard about partnerships, commodity boards who are here and have been supporting a lot of excellent research through partnership by actually putting in funding in partnership with NIFA. All of these things are extremely important.

[01:02:00] I think what we heard was surprisingly very aligned like Dr. Abalyn said, very aligned with NIFA's thinking as well because these sessions, which we are having now are after we've already had an internal listening sessions. There also this nexus between social and biophysical sciences came up very loud and clear. We must [01:02:30] not forget the human dimension or social sciences

aspect of food agriculture, natural resources, as well as the human sciences themselves in NIFA's portfolio as an agenda. We are going to go around the country and all these ideas, which would be brought forward we will, and I assure you on behalf of NIFA's leadership, we will [01:03:00] review all of these comments, we would analyze all of these comments and see what themes evolve out of all of this input, which we are receiving. We expect to use not only our own reading skills and understanding skills but also there are a lot of technologies available. We might even use some digital technologies for example, like topic modeling, which would help us pick some of the overarching themes, [01:03:30] which are coming out of these discussions and conversations.

At the end of the day, we certainly hope that these conversions would inform NIFA in bridging the programmatic gaps, which we might have currently in our portfolio. Also, starting some newer programs, which might come out of these conversations, but more importantly, these conversations [01:04:00] would inform of our future funding priority, our budget process that are very discrete mechanism NIFA uses to fund our programs. We heard a lot that we need more funding. Absolutely, that's something which NIFA constantly is very aware of. We also heard loud and clear that capacity funding really is the foundation or bedrock was the term [01:04:30] used, to have the infrastructure which would lead us towards these next generation innovation and all. We will pay attention to that.

We heard about education, development of next generation of scientist. NIFA currently have a lot of excellent education programs, almost pipeline or pathways approach. We will certainly look into those and see how we can enhance [01:05:00] NIFA's efforts in developing future scientist. Also, providing some experiential learning. Daryl, for example, brought up a very good point earlier that experiential learning is also as important as scientific learning. Hands on training and all so we would certainly look into those things as well.

I think at this point, I want to thank all of you. [01:05:30] Truly thank you for coming up, coming out and talking to us and presenting your ideas. We value your input tremendously and together I have no doubts that we will make the difference in the lives of people of this great country. Thank you so much, looking forward to our continuing interaction, your feedback in some shape or form will [01:06:00] be analyzed and either posted on our website or communicated back to you in some shape or form. I don't know what at this point, but we will certainly come up with some mechanism so that in future, we can remain engaged. This must not stop here. I think we will certainly continue this interaction and feedback loop. Thank you so much and have safe travels back home [01:06:30] and let other colleagues know those who have not been able to participate today that as Megan said, there are online opportunities still available for feedback.

Thank you so much.